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memorandum

Nuclear Criticality Safety Committee

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Nuclear Criticality Safety Committee May 2012 Assessment of NCERC

Executive Summary

The Laboratory Nuclear Criticality Safety Committee (NCSC) conducted an assessment at NCERC (National Critical Experiments Research Center) from May 14-16, 2012. We examined whether procedures at NCERC adhere to SD130, and assessed the overall health of the criticality safety program at NCERC against requirements from ANSI/ANS-8.19-2005 and DOE-STD-1158-2010.

Based on interviews, the facility tour, the operation witnessed, and documents reviewed, **the NCSC concludes that the Los Alamos nuclear criticality safety program has been substantially implemented at NCERC, and that this implementation provides a solid basis for operations at NCERC.** We are pleased that Los Alamos staff are well informed of the requirements of criticality safety and incorporate those requirements in to their work.

The NCSC did identify one finding against ANSI/ANS 8.19, Section 4.5 Management Responsibilities "Training and Qualification of NCS Staff." Two substantial deficiencies in the Laboratory program were apparent during our assessment:

- **Laboratory management has not provided sufficient numbers of qualified NCS staff members to support the mission at NCERC.**
- **Laboratory management has not established a qualification program for the criticality safety staff.**

We also identified eight opportunities for improvement, which address issues including some that are internal to Los Alamos operations at NCERC, some that are internal to NCERC but broader than Los Alamos, and some that are internal to Los Alamos but broader than NCERC.

The basis for our conclusion, the identified finding, and the opportunities for improvement are included in detail in the text of the report.

Introduction

The Laboratory's Nuclear Criticality Safety Committee (NCSC) conducted an assessment at NCERC (National Criticality Experiments Research Center) on May 14-16, 2012. This report summarizes the background, purpose, scope, criteria, and approach of the assessment. In addition, we summarize the results of the assessment, including one finding and eight opportunities for improvement.

Background and Purpose of Assessment

The Los Alamos System Description SD130 "*Nuclear Criticality Program*," states that "the NCSC must … monitor the NCSP by conducting periodic reviews with a frequency that ensures that the applicable major program elements are assessed at least once every three years." This assessment of NCERC fulfills that requirement of SD130 as well as similar requirements found in the NCSC Charter (DIR-07-191).

Although the Laboratory has been conducting nuclear operations at the DAF (Device Assembly Facility, located at the Nevada National Security Site [NNSS]) for some time, the full range of nuclear operations, including those at NCERC, has only recently been realized. The Los Alamos owner of the facility-specific Nuclear Criticality Safety Program at NCERC, David K. Hayes (NEN-2 Group Leader) invited the NCSC to perform this assessment partially to introduce the committee to NCERC operations. The assessment was conducted concurrently with one being performed by the Laboratory's Critical Experiments Safety Committee (CESC).

Scope of Assessment

The primary focus of this assessment was the Los Alamos Nuclear Criticality Safety Program at NCERC. NCERC formally occupies only a portion of the DAF. Related activities occur in other areas of the DAF as well. Therefore, we also included the Nuclear Material Handling and Measurements (NMHM) Project at the DAF within the scope of this assessment.

Los Alamos does have other operations involving nuclear materials that occur within the DAF, for example those related to sub-critical experiments. We did not include these operations within the scope of this assessment.

NSTEC (National Security Technologies) is the primary operator of the NNSS, and therefore of the DAF. Los Alamos operations are authorized through a secondary REOP (Real Estate / Operations Permit). Therefore, it was natural that this assessment would explore interfaces between Los Alamos and NSTEC (and in fact we do provide comments related to this interface). In no way, however, did the scope of this assessment include a review of the NSTEC Nuclear Criticality Safety Program. Nor did it include a review of the Lawrence Livermore National Laboratory (LLNL) Nuclear Criticality Safety Program, despite the fact that LLNL has provided Criticality Safety Evaluations (CSE) used by Los Alamos.

We noted previously that the NCSC assessment was conducted concurrently with one being performed by the Laboratory's Critical Experiments Safety Committee. Intended criticality, as results from experiments using critical machines, is under the purview of the CESC, not the NCSC. The CESC report may be found in reference IAT-1(U):12-007.

Criteria for Assessment

ANSI/ANS-8.19-2005 Sections 4, 5, and 7-9 were used to develop review criteria and the associated lines of inquiry were taken from the corresponding sections of DOE-STD-1158-2010. The review areas from ANSI/ANS-8.19-2005 are:

- Section 4 – Management responsibilities,
- Section 5 – Supervisory responsibilities,
- Section 7 – Operating procedures,
- Section 8 – Process evaluation for nuclear criticality safety, and
- Section 9 – Materials control.

The assessment team also examined the alignment of the nuclear criticality safety program at NCERC to the Laboratory's SD130 guiding document.

Assessment Approach

NCSC members who participated in the assessment were Dave Costa, Bill Crooks, Paul Felsher, and Bob Little (Chair). NCSC member Dave Hayes was our host during the assessment (in his role as NEN-2 Group Leader) and therefore did not participate as a member of the NCSC. There was no DOE shadow.

The NCSC assessment included interviews, document reviews, a field observation, and a tour.

The NCSC conducted the following interviews:

- An NSTEC Criticality Safety Engineer
- The NEN-6 Acting Group Leader
- A Fissile Material Handler (FMH)
- The NEN-2 Criticality Safety Officer (CSO), who is also qualified as a PIC (Person in Charge)
- The NEN-2 Group Leader

The locations toured during the assessment included:

- A high bay,
- A control room,
- The round rooms where the critical machines are located, and
- A vault for material storage.

We observed an operation that included a pre-job brief, a material move, material staging, and an RTO (Radiation Test Object) construction.

Documents that were reviewed as part of the assessment included:

- NSTEC Company Directive CD-NOPS.001 (*Nuclear Criticality Safety Program*),
- Draft version of NSTEC Program Description PD-NOPS.003 (*Integrated Criticality Safety Program Description*),
- JNPO-PRO-105 (*JNPO Nuclear Criticality Safety Procedure*),
- CEF-PLA-014 (*NCERC Administrative Practices for Nuclear Criticality Safety*),
- NMHM-PLA-007 (*NMHM Administrative Practices for Nuclear Criticality Safety*),
- CEF-SOP-006 (*Radiation Test Object Construction Procedure*),
- CEF-SOP-011 (*NCERC MBA Operations Procedure*),
- SD130 (*Nuclear Criticality Program*),
- NCS-CSLA-11-001 (*Godiva-IV Assembly and Disassembly Operations at the DAF*),
- Cross-Walk from provisions of CD-NOPS.001 to SD130 to CEF-PLA-014 (Created and provided by NSTEC),
- NCRS-DAF-2011-001 (*Device Assembly Facility (DAF) Criticality Accident Alarm System (CAAS) Needs Evaluation*),
- Entries from the JNPO Deficiency Tracking System (DTS), and
- Previous independent assessment reports and management self-assessment reports.

Any assessment such as this one requires the support of the organizations and individuals being assessed. The NCSC appreciates the cooperation we received from NCERC and NSTEC staff and also acknowledges the candor and openness shown by all. In particular, we would like to acknowledge Kim Scott for substantial logistical support.

Results

The Los Alamos nuclear criticality safety program has been substantially implemented at NCERC, and this implementation provides a solid basis for operations at NCERC. Los Alamos staff – both those who are part of the permanent party in Nevada and those who are based in Los Alamos but campaign at NCERC – are well informed of the requirements of criticality safety and incorporate those requirements in to their work. To the best of our knowledge, there have been no criticality safety infractions at NCERC.

However, the Los Alamos staff responsible for executing work at NCERC are not an island unto themselves. In fact, they are reliant upon others and work in an environment that is very inter-dependent on other organizations. Several of the weaknesses we observed have their origin from this inter-dependence.

We have consolidated our concerns into one Finding and eight Opportunities for Improvement. Details are provided in the following sections.

Finding

Our one finding is against ANSI/ANS 8.19, Section 4.5 Management Responsibilities "Training and Qualification of NCS Staff." Two substantial deficiencies in the Laboratory program were apparent during our assessment:

- **Laboratory management has not provided sufficient numbers of qualified NCS staff members** to support the mission at NCERC. We were told that over a dozen criticality safety evaluations (CSEs) for various operations were in the queue, with a half dozen being ready for SB-CS peer review (note that the draft CSEs had been created by NEN-2 staff – not SB-CS staff!). However, there was no recent progress and no indication of near-term hope of SB-CS staff being able to conduct the peer review necessary to finalize the CSEs, which are necessary before Criticality Safety Limit Approvals (CSLAs) can be finalized and incorporated into NCERC procedures allowing for operations. The lack of qualified staff (coupled with no mechanism for the Laboratory to prioritize SB-CS work – a point this committee has made in previous assessments) will clearly lead to an inability to execute operations at NCERC on behalf of customers without substantial attention from Laboratory management. Note that this is not a recent phenomenon – several of the original CSEs (some of which are still being used by Los Alamos staff for operations) were created by LLNL because of a lack of staff availability from SB-CS at Los Alamos.
- **Laboratory management has not established a qualification program for the criticality safety staff.** We were told that the current program is "lacking in formality" and perceived to be a rather arbitrary "check-the-box" procedure.

Opportunities for Improvement

During the assessment a number of additional issues were identified that, in the opinion of the NCSC, if addressed, would further strengthen the NCS program at NCERC. Some are institutional in nature, some cross organizations, and some are specific to Los Alamos operations at NCERC. We document these below as eight Opportunities for Improvement (OFI):

1. Opportunity for Improvement # 1 (OFI-1) "NEN Division Roles and Responsibilities" – Immediately prior to our visit to NCERC a re-organization was announced in N (now NEN) Division that impacted Los Alamos workers at NCERC. Specifically, a modest number of individuals who comprise the "permanent party" at NCERC were moved from NEN-2 to a new group, NEN-6. The NCSC offers no opinion pro or con on this re-organization. However, we do warn that this change requires a close examination of roles and responsibilities regarding criticality safety, particularly at the interface between the two groups. Questions such as who signs and owns experimental plans, CSLAs, etc., who would one report occurrences to, and who is the RLM for NEN-2 experimentalists performing operations at NCERC need answers. CEF-PLA-014 should be examined for any updates required.

2. Opportunity for Improvement # 2 (OFI-2) "LANL, LLNL, and NSTEC Roles and Responsibilities" – As mentioned earlier, NSTEC is the primary operator of the DAF and Los Alamos operations at NCERC are carried out through a secondary REOP. Livermore is also involved. As a result there are several guiding criticality-safety documents including NSTEC's CD-NOPS.001, JNPO's (Joint Nevada Program Office) JNPO-PRO-105, LANL's SD130, LANL's CEF-PLA-014, and LLNL's UCRL-AM-133867. Clearly the opportunity for confusion and inconsistencies is therefore greater at NCERC than at facilities "wholly-owned" by Los Alamos. For example, a minor inconsistency between JNPO-PRO-105 and SD130 in the definition of "significant quantity" of material was pointed out to us. More important, however, was ongoing disagreement between Los Alamos and NSTEC on the process for elevating criticality controls to the TSR (Technical Safety Requirements). The CCR (Criticality Control Review) process defined in draft document PD-NOPS.003 is summarized in a "Simplified Flowchart" in that document's Appendix C that to us appears not to be simple. In fact, the draft PD-NOPS.003 available to us at the time of the assessment did not appear to add significant value. More work is needed to ensure that roles and responsibilities of NSTEC and the Laboratories are clear and workable as regards criticality safety. It was also pointed out to us that it would be helpful if there were better coordination of training plans and records between Los Alamos and NSTEC.

3. Opportunity for Improvement # 3 (OFI-3) "Security vs. Safety" – The security posture at the DAF is understandably high. However, we were given examples that cause us to be concerned that security is unnecessarily tantamount to safety in the facility. For example, we were told that during table-top discussions regarding the response to a potential criticality accident, it was made clear that security would permit only 2 ambulances inside the gates – and if there were more people in need of medical attention they would need to be stretchered out. We also observed a posted sign that warned people that in the case of a criticality accident they must be careful not to reveal the room number where the accident took place over the phone. A concern about releasing OUO information when lives could be at risk is indicative to us that the safety culture at the DAF needs to be elevated substantially relative to the security culture.

4. Opportunity for Improvement # 4 (OFI-4) "CSO Training" – The NCERC Criticality Safety Officer (CSO) is competent, knowledgeable, and conscientious. However, he indicated that he had picked up most of his CSO knowledge via "on the job training." Lack of Laboratory-wide training for CSOs has been identified as a problem in previous assessments of other facilities. Similarly, there is no Lab-wide mechanism for sharing lessons learned among CSOs. The NCSC once again recommends that this problem be addressed by the Laboratory.

5. Opportunity for Improvement # 5 (OFI-5) "Number of Qualified PICs" – At the time of our visit there were only two qualified PICs (Person in Charge). This must be a concern for sustained operations at the facility. Much like initiatives to increase the number of crew chiefs and qualified machine operators, there needs to be attention paid to the number of qualified PICs as well.

6. Opportunity for Improvement # 6 (OFI-6) "Yearly Reviews of Operations" – SD130 requires that responsible managers / supervisors review each operation annually to "ascertain that procedures are being followed and that process conditions have not been altered…" This review is to be done with participation of SB-CS. We were told that operations with LANL CSEs had been reviewed recently. However, there was some question about whether those operations still governed by a Livermore CSEs had been walked-down (or even if that was a requirement). This should be resolved.

7. Opportunity for Improvement # 7 (OFI-7) "Hands-on Training for FMHs" – The FMH we interviewed was relatively new in the position. The FMH had received training in criticality, but desired the additional training experience that can only be obtained through hands-on training. NEN Division conducts hands-on training at NCERC for the NCSP Program. We recommend that consideration be given to ensuring that FMHs attend this training as appropriate.

8. Opportunity for Improvement # 8 (OFI-8) "Follow up Actions to Previous Assessments" – We reviewed reports from two previous CEF Management Self-Assessments of Criticality Safety (one conducted on 8/17/11 with report dated 8/17/11 and one conducted on 10/19/10 with report dated 6/6/11). In those reports a variety of findings, issues, and OFIs were identified. From other documentation, it appears that the findings were addressed and closed. Several, but not all of the issues were closed. We have seen no documentation to indicate action taken on the identified OFIs. We recommend that NCERC review these previous management self-assessments for any outstanding issues still warranting action.

Summary

The Laboratory Nuclear Criticality Safety Committee (NCSC) conducted an assessment at NCERC from May 14-16, 2012. The assessment fulfilled requirements from SD130 and the NCSC charter to monitor the NCSP by conducting periodic reviews with a frequency that ensures that the applicable major program elements are assessed at least once every three years. We examined whether procedures at NCERC adhere to SD130, and assessed the overall health of the criticality safety program at NCERC against requirements from ANSI/ANS-8.19-2005 and DOE-STD-1158-2010.

Based on interviews, the facility tour, the operation witnessed, and documents reviewed, the NCSC concludes that the Los Alamos nuclear criticality safety program has been substantially implemented at NCERC. We are pleased that Los Alamos staff are well informed of the requirements of criticality safety and incorporate those requirements in to their work. We conclude that operations at NCERC that rely on the nuclear criticality safety program are executed safely.

We identified several opportunities for improvement, which address issues including some that are internal to Los Alamos operations at NCERC, some that are internal to NCERC but broader

than Los Alamos, and some that are internal to Los Alamos but broader than NCERC. Of particular note is our one finding that reflects upon Los Alamos management responsibilities for training and qualification of NCS staff – namely that Laboratory management has not provided sufficient numbers of qualified NCS staff nor has Laboratory management established a qualification program for the criticality safety staff.

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